

ABSTRACT

Apparatus and methods are provided for interacting light with particles, including but not limited to biological matter such as cells, in unique and highly useful ways. Optophoresis consists of subjecting particles to various optical forces, especially
5 optical gradient forces, and more particularly moving optical gradient forces, so as to obtain useful results. In biology, this technology represents a practical approach to probing the inner workings of a living cell, preferably without any dyes, labels or other markers. In one aspect, a method is provided for interacting an optical gradient field in three dimensions with a particle by interfering two beams to generate a plurality of planar
10 fronts, providing a plurality of particles in a medium, and moving the planar fronts relative to the particles, whereby the particles are separated at least in part based upon the dielectric constant of the particles.